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Japanese Patent Application SN 2000 - 397646

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[DOCUMENT NAME] SPECIFICATION

[TITLE OF THE INVENTION] TRANSMITTING/RECEIVING SYSTEM AND TRANSMITTING/RECEIVING APPARATUS

[CLAIMS]

[Claim1] A transmitting/receiving system comprising first and second transmitting/receiving apparatuses which mutually carry out transmissions and receptions, wherein

said second transmitting/receiving apparatus includes

a plurality of band-pass means having different passing bands for a signal which has been received from said first transmitting/receiving apparatus,

a plurality of receiving quality detection means which are provided in response to said band-pass means and detect receiving quality information of a signal which has passed through said corresponding band-pass means, and

a receiving quality control means which generates, based on said receiving quality information provided by said plurality of receiving

quality detection means, a receiving quality control signal for each passing band, wherein

said receiving quality control signal is a signal which becomes a basis for controlling the level of a signal transmitted by said first transmitting/receiving apparatus, and

said first transmitting/receiving apparatus adjusts, based on said receiving quality control signal which has been transmitted by said second transmitting/receiving apparatus, the level of a signal to be transmitted for each passing band.

[Claim2] A transmitting/receiving system as set forth in Claim 1, wherein

said receiving quality information is both or either one of bit errors and a signal level.

[Claim3] A transmitting/receiving system as set forth in Claim 1 or 2, wherein

said receiving quality control means uses said receiving quality information as said receiving quality control signal.

[Claim4] A transmitting/receiving system as set forth in Claim 1 or 2, wherein

said receiving quality control means includes an electric energy control signal generating means for generating an electric energy control signal which adjusts the electric energy level of a signal to be transmitted by said first transmitting/receiving apparatus for each passing band, and

this electric energy control signal is said receiving quality control signal.

[Claim5] A transmitting/receiving system as set forth in Claim 1 or 2, wherein

said receiving quality control means includes an electric energy amount information generating means for generating electric energy amount information concerning the electric energy amount-designating value of each passing band that said second transmitting/receiving apparatus demands from a signal transmitted by said first transmitting/receiving apparatus, and

this electric energy amount information is said receiving quality

control signal.

[Claim6] A transmitting/receiving system as set forth in Claim 1 or 2, wherein

said receiving quality control means includes an error rate of receiving data-measuring means for measuring the error rate of receiving data, which is a ratio of error bits contained in receiving data per unit time, for each passing band, and

a signal representing this error rate of receiving data is said receiving quality control signal.

[Claim7] A transmitting/receiving system as set forth in Claim 1 or 2, wherein

said receiving quality control means includes a number of error bits in receiving-measuring means for measuring the number of error bits in receiving, which is the number of error bits per unit time, for each passing band, and

a signal representing this number of error bits in receiving is said receiving quality control signal.

[Claim8] A transmitting/receiving system as set forth in Claim 1 to 7, wherein

said first transmitting/receiving apparatus comprises a modulation means for applying a modulation according to the characteristics of a transmission way and

said second transmitting/receiving apparatus comprises a demodulation means which is conformable to said modulation means.

[Claim9] A transmitting/receiving system as set forth in Claim 1 to 7, wherein

said first transmitting/receiving apparatus comprises a modulation means, a multi-carrier method is employed as a modulation method in this modulation means, and

said second transmitting/receiving apparatus comprises a demodulation means which is conformable to said modulation means.

[Claim10] A transmitting/receiving system as set forth in Claim 1 to 7, wherein

said first transmitting/receiving apparatus comprises a modulation

means, a spread spectrum method is employed as a modulation method in this modulation means, and

said second transmitting/receiving apparatus comprises a demodulation means which is conformable to said modulation means.

[DETAILED DESCRIPTION]

【0001】

[TECHNICAL FIELD]

The present invention relates to a transmitting/receiving system for carrying out data transmission.

【0002】

[PRIOR ART]

In communications using a transmission way where transmission characteristics significantly deteriorate due to distortion and noise, a method is employed, wherein a transmitter generates a spread spectrum signal and carries out transmission by means of an occupied bandwidth which is broader in terms of the frequency axis than the transmission rate.

【0003】

By employing a broad occupied band as such, even if transmission characteristics deteriorate in some bands, transmission can be carried out by utilizing energy of other bands.

【０００４】

On the other hand, a receiver takes out a received signal from each of the subbands having different passing bands and synthesizes the received signals thus taken out, whereby carrying out decoding data.

【０００５】

A general subband synthesizing method is disclosed in Japanese Unexamined Patent Publication No. Hei-7-66751, for example. In this subband synthesizing method, receiving quality is judged for each subband and selective synthesis is performed.

【０００６】

Fig. 14 is a block diagram of a prior subband receiving apparatus which realizes this subband synthesizing method.

【０００７】

As shown in Fig. 14, this subband receiving apparatus comprises a

plurality of band-pass units A1-An and a synthesizer 103. The respective band-pass units A1-An include a subband filter 100, a demodulation means 101, and a receiving quality detection means 102.

【0008】

In this subband receiving unit, a signal S20 which has been received is given to a plurality of subband filters 100. The respective subband filters 100 allow a signal having different frequency bands to pass.

【0009】

The demodulation means 101 demodulates a signal S21 which has passed through the corresponding subband filter 100 and generates demodulated data S22. The receiving quality detection means 102 performs error detection of the demodulated data S22 which has been inputted from the corresponding demodulation means.

【0010】

The synthesizer 103 judges receiving quality of each passing band by means of error detection information S23 which has been inputted from

the plurality of receiving quality detection means 102. Then, the synthesizer 103 selectively synthesizes the demodulated data S22 of each passing band in accordance with the judgement results and generates receiving data S24.

【0011】

[TECHNICAL PROBLEM]

However, in the prior subband receiving unit, in a case where the amount of distortion and noise on the transmission way is large and line characteristics significantly deteriorate, the receiving quality may deteriorate in all passing bands in the receiving portion and it may become difficult to correctly decode the transmitted data.

【0012】

In addition, in bands where line characteristics have significantly deteriorated and data decoding is impossible, carrying out transmitting and receiving processing using unnecessary energy may interfere with other bands, causing errors in selectively synthesized receiving data.

【0013】

It is an object of the present invention to reduce deterioration in the receiving quality and provide a transmitting/receiving system wherein high quality communications can be realized.

【0014】

[MEANS]

A transmitting/receiving system according to a first aspect of the invention comprises first and second transmitting/receiving apparatuses which mutually carry out transmissions and receptions, wherein the second transmitting/receiving apparatus includes a plurality of band-pass means having different passing bands for a signal which has been received from the first transmitting/receiving apparatus, a plurality of receiving quality detection means which are provided in response to the band-pass means and detect receiving quality information of a signal which has passed through the corresponding band-pass means, and a receiving quality control means which generates, based on the receiving quality information provided by the plurality of receiving quality detection means, a receiving quality control signal for each passing band, wherein the

receiving quality control signal is a signal which becomes a basis for controlling the level of a signal transmitted by the first transmitting/receiving apparatus, and the first transmitting/receiving apparatus adjusts, based on the receiving quality control signal which has been transmitted by the second transmitting/receiving apparatus, the level of a signal to be transmitted for each passing band.

【0015】

According to this construction, the first transmitting/receiving apparatus can transmit a signal at an appropriate level where the receiving quality in the second transmitting/receiving apparatus is taken into consideration. As a result, deterioration in the receiving quality of the second transmitting/receiving apparatus can be reduced.

【0016】

[EMBODIMENTS OF THE INVENTION]

A transmitting/receiving system according to a first aspect of the invention comprises first and second transmitting/receiving apparatuses which mutually carry out transmissions and receptions, wherein the

second transmitting/receiving apparatus includes a plurality of band-pass means having different passing bands for a signal which has been received from the first transmitting/receiving apparatus, a plurality of receiving quality detection means which are provided in response to the band-pass means and detect receiving quality information of a signal which has passed through the corresponding band-pass means, and a receiving quality control means which generates, based on the receiving quality information provided by the plurality of receiving quality detection means, a receiving quality control signal for each passing band, wherein the receiving quality control signal is a signal which becomes a basis for controlling the level of a signal transmitted by the first transmitting/receiving apparatus, and the first transmitting/receiving apparatus adjusts, based on the receiving quality control signal which has been transmitted by the second transmitting/receiving apparatus, the level of a signal to be transmitted for each passing band.

【００１７】

According to this construction, the first transmitting/receiving

apparatus can transmit a signal at an appropriate level where the receiving quality in the second transmitting/receiving apparatus is taken into consideration. As a result, deterioration in the receiving quality of the second transmitting/receiving apparatus can be reduced.

【0018】

In a transmitting/receiving system according to a second aspect of the invention, in addition to the first aspect of the invention, the receiving quality information is both or either one of bit errors and a signal level.

【0019】

According to this construction, the receiving quality in the second transmitting/receiving apparatus can be properly judged and the first transmitting/receiving apparatus can transmit a signal on a more appropriate level. As a result, deterioration in the receiving quality in the second transmitting/receiving apparatus can further be reduced.

【0020】

In a transmitting/receiving system according to a third aspect of the invention, in addition to the first aspect of the invention, the receiving

quality control means uses the receiving quality information as the receiving quality control signal.

【0021】

According to this construction, compared to a case where a receiving quality control signal having different content from the receiving quality information is generated, the receiving quality control means can be simplified.

【0022】

In a transmitting/receiving system according to a fourth aspect of the invention, in addition to the first aspect of the invention, the receiving quality control means includes an electric energy control signal generating means for generating an electric energy control signal which adjusts the electric energy level of a signal to be transmitted by the first transmitting/receiving apparatus for each passing band, and this electric energy control signal is the receiving quality control signal.

【0023】

According to this construction, the first transmitting/receiving

apparatus can use the content of the receiving quality control signal to be transmitted by the second transmitting/receiving apparatus without modification and adjust the electric energy level of the signal to be transmitted.

【0024】

In a transmitting/receiving system according to a fifth aspect of the invention, in addition to the first aspect of the invention, the receiving quality control means includes an electric energy amount information generating means for generating electric energy amount information concerning the electric energy amount-designating value of each passing band that the second transmitting/receiving apparatus demands from a signal transmitted by the first transmitting/receiving apparatus, and this electric energy amount information is the receiving quality control signal.

【0025】

According to this construction, the first transmitting/receiving apparatus can transmit a signal which satisfies the amount of electric energy-designating value demanded by the second transmitting/receiving

apparatus. As a result, the receiving quality in the second transmitting/receiving apparatus can be made satisfactory.

【0026】

In a transmitting/receiving system according to a sixth aspect of the invention, in addition to the first aspect of the invention, the receiving quality control means includes an error rate of receiving data-measuring means for measuring the error rate of receiving data, which is a ratio of error bits contained in receiving data per unit time, for each passing band, and a signal representing this error rate of receiving data is the receiving quality control signal.

【0027】

According to this construction, the first transmitting/receiving apparatus can, in addition to the first or second invention, generate a signal to be transmitted while taking the error rate of receiving data of the second transmitting/receiving apparatus into consideration. As a result, receiving errors in the second transmitting/receiving apparatus can be reduced.

【００２８】

In a transmitting/receiving system according to a seventh aspect of the invention, in addition to the first aspect of the invention, the receiving quality control means includes the number of error bits in receiving-measuring means for measuring the number of error bits in receiving, which is the number of error bits per unit time, for each passing band, and a signal representing this number of error bits in receiving is the receiving quality control signal.

【００２９】

According to this construction, the first transmitting/receiving apparatus can generate a signal to be transmitted with the number of error bits of the second transmitting/receiving apparatus taken into consideration. As a result, receiving errors in the second transmitting/receiving apparatus can be reduced.

【００３０】

In a transmitting/receiving system according to an eighth aspect of the invention, in addition to the first aspect of the invention, the first

transmitting/receiving apparatus comprises a modulation means for applying a modulation according to the characteristics of a transmission way and the second transmitting/receiving apparatus comprises a demodulation means which is conformable to the modulation means.

【００３１】

According to this construction, the first transmitting/receiving apparatus can transmit a signal which is not easily adversely affected by the transmission way.

【００３２】

In a transmitting/receiving system according to a ninth aspect of the invention, in addition to the first aspect of the invention, the first transmitting/receiving apparatus comprises a modulation means, a multi-carrier method is employed as a modulation method in this modulation means, and the second transmitting/receiving apparatus comprises a demodulation means which is conformable to the modulation means.

【００３３】

In such a multi-carrier method, if the SN ratio deteriorates in some bands, a signal only in the deteriorated bands cannot be demodulated but a signal in other bands can be demodulated.

【0034】

Therefore, with respect to bands where deterioration in the receiving quality of the second transmitting/receiving apparatus is not improved even though the first transmitting/receiving apparatus adjusts the level of the signal to be transmitted based on the receiving quality control signal, the first transmitting/receiving apparatus can perform control for reducing or stopping output of a signal to be transmitted.

【0035】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy outputs a reduction in electric power consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained.

【0036】

In a transmitting/receiving system according to a tenth aspect of the

invention, in addition to the first aspect of the invention, the first transmitting/receiving apparatus comprises a modulation means, a spread spectrum method is employed as a modulation method in this modulation means, and the second transmitting/receiving apparatus comprises a demodulation means which is conformable to the modulation means.

【００３７】

In such a spread spectrum method, even if the SN ratio deteriorates in some bands, when the SN ratio can be secured in other bands, demodulation is possible.

【００３８】

Therefore, with respect to bands where deterioration in the receiving quality of the second transmitting/receiving apparatus is not improved even though the first transmitting/receiving apparatus adjusts the level of the signal to be transmitted based on the receiving quality control signal, the first transmitting/receiving apparatus can perform control for reducing or stopping output of a signal to be transmitted.

【００３９】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy output, a reduction in electric power consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained.

【0040】

Hereinafter, embodiments of the present invention will be described in detail with reference to the drawings.

(Embodiment 1)

Fig. 1 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 1 of the invention.

【0041】

As shown in Fig. 1, this transmitting/receiving system comprises transmitting/receiving apparatuses 1 and 2. The transmitting/receiving apparatus 1 comprises a transmitting signal control means 11 and a receiving quality control signal-extracting means 12.

【0042】

The transmitting/receiving apparatus 2 comprises a plurality of band-pass units U1-Un, a receiving quality control means 23, and a transmitting signal generating means 24. The respective band-pass units U1-Un include a band-pass means 21 and a receiving quality detection means 22.

【0043】

Herein, the respective band-pass means 21 have different passing bands and allow signals having different frequency bands to pass.

【0044】

Now, operations will be described. A signal S1 which has been transmitted from the transmitting/receiving apparatus 1 passes through a transmission way 3 and is received by the transmitting/receiving apparatus 2.

【0045】

The signal S1 thus received is inputted into each band-pass means 21. Fig. 2 is an exemplary view of passing bands in the band-pass means 21. Herein, Fig. 2 shows an example in a case where the band-pass

means 21 are composed of two systems (a case where the band-pass units U1-Un are two systems).

【0046】

As shown in Fig. 2, the band-pass means 21 of the band-pass unit U1 has a passing band 50 and allows, of the received signal S1, only a signal in this band to pass. On the other hand, the band-pass means 21 of the band-pass unit U2 has a passing band 51 and allows, of the received signal S1, only a signal in this band to pass.

【0047】

As shown in Fig. 1, the received signal S1 passes through the band-pass means 21 and is inputted into the corresponding receiving quality detection means 22 as a band-pass signal S2.

【0048】

The receiving quality detection means 22 takes out receiving data S3 from the band-pass signal S2 and also detects receiving quality information S4 by means of the band-pass signal S2 for an output to a receiving quality control means 23. This receiving quality information

S4 is bit errors, a signal level and/or the like (which will be explained in Embodiment 2).

【0049】

The receiving quality control means 23 generates, based on the receiving quality information S4 inputted from the plurality of receiving quality detection means 22, a receiving quality control signal S5 of each passing band. This receiving quality detecting signal S5 is a signal which becomes a basis for controlling the electric energy level of the signal S1 transmitted by the transmitting/receiving apparatus 1 for each passing band.

【0050】

Concretely, the receiving quality control signal S5 is an electric energy control signal for adjusting the electric energy level of the signal S1 to be transmitted by the transmitting/receiving apparatus S1, the electric amount information concerning the amount of electric energy-designating value which the second transmitting/receiving apparatus 2 demands from the signal S1, an error rate of receiving data,

the number of error bits in receiving or the like (which will be descried in Embodiments 3-6).

【0051】

In addition, as the receiving quality control signal S5, the receiving quality information S4 to be outputted by the receiving quality detection means 22 may be used without modification. In this case, compared to a case where the receiving quality control signal S5 having different content from the receiving quality information S4 is generated, construction of the receiving quality control means 23 can be simplified.

【0052】

The transmitting signal generating means 24 generates a signal S7 by means of the receiving quality control signal S5 inputted from the receiving quality control means 23 and transmitting data S6.

【0053】

Fig. 3 is a constructional diagram of the signal S7 which the transmitting signal generating means 24 transmits to the transmitting/receiving apparatus 1. As shown in Fig. 3, in this signal S7,

one frame is composed of a preamble, a unique word, a receiving quality control signal, and transmitting data.

【0054】

In Fig. 3, the receiving quality control signal is composed of the receiving quality control signal S5 for each passing band.

【0055】

Then, as shown in Fig. 1, the signal S7 transmitted from the transmitting/receiving apparatus 2 is received by the transmitting/receiving apparatus 1 via the transmission way 3. A receiving quality control signal extracting means 12 takes out receiving data S8 from the received signal S7 and also extracts the receiving quality control signal S5.

【0056】

The receiving quality control signal extracting means 12 outputs the extracted receiving quality control signal S5 to a transmitting signal control means 11 as transmitting signal control information S9.

【0057】

Furthermore, the receiving quality control signal S5 and

transmitting signal control information S9 may be identical or different in the method for expressing the signal. However, both have identical content in such respect that both are signals which aim to control electric energy for the signal S1 to be transmitted by the transmitting/receiving apparatus 1.

【0058】

The transmitting signal control means 11 generates the signal S1 by means of transmitting data S10. At this time, the transmitting signal control means 11 adjusts the transmitting electric energy of the signal S1 in accordance with the transmitting signal control information S9 inputted from the receiving quality control signal extracting means 12 (control of transmitting electric energy).

【0059】

As mentioned above, the receiving quality control signal S5 and the transmitting signal control information S9 are identical in content, therefore this is referable as the transmitting electric energy of the signal S1 is controlled based on the receiving quality control signal S5.

【0060】

Furthermore, control for the transmitting electric energy by the transmitting signal control means 11 is performed in each frequency band (each passing band of the transmitting/receiving apparatus 2). Then, the signal S1 which has been controlled in terms of the transmitting electric energy by the sending signal control means 11 is propagated through the transmission way 3 and received by the transmitting/receiving apparatus 2.

【0061】

As above, in the present embodiment, the transmitting/receiving apparatus 2 divides the received signal S1 for different bands by means of the band-pass means 21, detects the receiving quality information S4, and generates the receiving quality control signal S5. Then, the transmitting/receiving apparatus 2 transmits the receiving quality control signal S5 based on the receiving quality information S4 to the transmitting/receiving apparatus 1.

【0062】

Accordingly, the transmitting/receiving apparatus 1 can perform,

based on the receiving quality control signal S5, electric energy control of the signal S1 to be transmitted while taking the receiving quality of the transmitting/receiving apparatus 2 into consideration.

【0063】

As a result, the transmitting/receiving apparatus 1 can transmit a signal at an appropriate level where the receiving quality in the transmitting/receiving apparatus 2 is taken into consideration, therefore deterioration in the receiving quality in the transmitting/receiving apparatus 2 can be reduced.

【0064】

Herein, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained. Moreover, in the present embodiment, a modulator-demodulator means may be provided.

【0065】

Moreover, the receiving quality control signals S5 generated for each passing band may be output to the transmitting signal generating

means 24 in a lump.

【0066】

(Embodiment 2)

Fig. 4 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 2 of the invention. In Fig. 4, identical symbols are used for portions and signals that are identical to those of Fig. 1 and description thereof will be omitted.

【0067】

The transmitting/receiving system of Fig. 4 shows a concrete construction example of the receiving quality detection means 22 of the transmitting/receiving system of Fig. 1. Namely, each receiving quality detection means 22 of the present embodiment comprises an error detection means 25 and a signal level measuring means 26. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 1.

【0068】

Now, operations will be described. The band-pass signal S2

inputted into the receiving quality detection means 22 is inputted into the error detection means 25 and the signal level measuring means 26.

【0069】

The error detection means 25 generates bit error information S11 by means of the band-pass signal S2 for an output to the receiving quality control means 23.

【0070】

The bit error information S11 is a signal for informing about the occurrence of bit errors. For example, the bit error information S11 is a state signal which becomes high level (H-level) only at a point in time where errors occur, a state signal which becomes H-level for only a period of time where errors occur or the like.

【0071】

On the other hand, the signal level measuring means 26 measures the signal level of the band-pass signal S2 and outputs signal level information S12 to the receiving quality control means 23. Herein, the bit error information S11 and the signal level information S12 correspond

to the receiving quality information S4 of Embodiment 1.

【0072】

The receiving quality control means 23 generates a receiving quality control signal S15 for each passing band by means of the bit error information S11 provided by the plurality of error detection means 25 and the signal level information S12 provided by the plurality of signal level measuring means 26. Other operations are similar to those of the transmitting/receiving system of Fig. 1 (Embodiment 1).

【0073】

As above, in the present embodiment, the receiving quality information to be detected by the receiving quality detection means 22 is the bit error information S11 and the signal level information S12.

【0074】

Therefore, compared to Embodiment 1, the receiving quality in the transmitting/receiving apparatus 2 can be more properly judged, thus the transmitting/receiving apparatus 2 can transmit the more proper receiving quality control signal S5 to the transmitting/receiving apparatus 1.

【0075】

Accordingly, based on the receiving quality control signal S5, the transmitting/receiving apparatus 1 can transmit the signal S1 at a more appropriate electric energy level to the transmitting/receiving apparatus 2. As a result, deterioration in the receiving quality in the transmitting/receiving apparatus 2 can further be reduced.

【0076】

Herein, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained. Moreover, in the present embodiment, a modulator-demodulator means may be provided.

【0077】

Moreover, in the receiving quality detection means 23 of Fig. 4, both the bit error information S11 and the signal level information S12 are detected and utilized, however, even in a case where either information is detected and utilized, similar effects can be obtained.

【0078】

In addition, as the receiving quality control signal S5, the bit error information S11 and the signal level information S12 to be outputted by the receiving quality detection means 22 may be used without modification. In this case, compared to a case where the receiving quality control signal S5 which is different in content from the bit error information S11 and the signal level information S12 is generated, the construction of the receiving quality control means 23 can be simplified.

【0079】

(Embodiment 3)

Fig. 5 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 3 of the invention. In Fig. 5, identical symbols are used for portions and signals that are identical to those of Fig. 1 and description thereof will be omitted.

【0080】

The transmitting/receiving system of Fig. 5 shows a concrete construction example of the receiving quality control means 23 of the transmitting/receiving system of Fig. 1. Namely, the receiving quality

control means 23 includes an electric energy control signal generating means 27.

【0081】

In addition, in the transmitting/receiving system of Fig. 5, the electric energy control signal extracting means 13 is provided in place of the receiving quality control signal extracting means 12 of the transmitting/receiving system of Fig. 1. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 1.

【0082】

Now, operations will be described. The electric energy control signal generating means 27 generates, based on the receiving quality information S4 from the plurality of receiving quality detection means 22, the electric energy control signal S13 for each passing band for an output to the transmitting signal generating means 24.

【0083】

Namely, an electric energy control signal generating means 27 judges, based on the receiving quality information S4 about each passing

band, the electric energy that is necessary for a data demodulation in the bands where the receiving quality has deteriorated. Then, based on the judgement results, the electric energy control signal generating means 27 generates the electric energy control signal S13.

【0084】

This electric energy control signal S13 is a signal for adjusting the electric energy level of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 in each passing band (a control signal for controlling the electric energy amount of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 for each passing band).

【0085】

As this electric energy control signal S13, there is, for example, a signal for issuing instructions to raise or lower the electric energy amount of the signal S1 to be transmitted to the transmitting/receiving apparatus 1. Herein, the electric energy control signal S13 corresponds to the receiving quality control signal S5 of Embodiment 1.

【００８６】

The transmitting signal generating means 24 generates the signal S7 by means of the electric energy control signal S13 that was inputted from the electric energy control signal generating means 27 and the transmitting data S6.

【００８７】

The electric energy control signal extracting means 13 of the transmitting/receiving apparatus 1 takes out the receiving data S8 from the received signal S7 and also extracts the electric control signal S13.

【００８８】

The electric energy control signal extracting means 13 then outputs the extracted electric energy control signal S13 to the transmitting signal control means 11 as the transmitting signal control information S9. Other operations are similar to those of the transmitting/receiving system of Fig. 1 (Embodiment 1).

【００８９】

In addition, the relationship between the electric energy control

signal S13 and the transmitting signal information S9 is similar to the relationship between the receiving quality control signal S5 and the transmitting signal control information S9 of Embodiment 1.

【0090】

As above, in the present embodiment, the transmitting/receiving apparatus 2 generates the electric energy control signal S13 which adjusts the electric energy level of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 for each passing band for a transmission to the transmitting/receiving apparatus 1.

【0091】

Thus, the transmitting/receiving apparatus 1 can adjust the electric energy level of the signal S1 to be transmitted by using the content of the electric energy control signal S13 to be transmitted by the transmitting/receiving apparatus 2 without modification. Moreover, effects which are similar to those of Embodiment 1 are provided.

【0092】

In addition, as long as the band-pass means 21 (band-pass units

U1-Un) has two systems or more, similar effects can be obtained. Furthermore, in the present embodiment, a modulator-demodulator means may be provided.

【0093】

In addition, as the receiving quality detection means 22 of the present embodiment, the error detection means 22 and the signal level measuring means 26 of Embodiment 2 may be used. In this case, effects which are similar to those of Embodiment 2 are also provided.

【0094】

In addition, the electric energy control signals S13 generated for each passing band may be output to the transmitting signal generating means 24 in a lump.

【0095】

(Embodiment 4)

Fig. 6 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 4 of the invention. In Fig. 6, identical symbols are used for portions and signals that are

identical to those of Fig. 1 and description thereof will be omitted.

【0096】

The transmitting/receiving system of Fig. 6 shows a concrete construction example of the receiving quality control means 23 of the transmitting/receiving system of Fig. 1. Namely, the receiving quality control means 23 of the transmitting/receiving system of the present embodiment includes an electric energy amount information generating means 28.

【0097】

In addition, in the transmitting/receiving system of Fig. 6, in place of the receiving quality control signal extracting means 12 of the transmitting/receiving system of Fig. 1, the electric energy amount information extracting means 14 is provided and furthermore, a transmitting signal control information generating means 15 is added. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 1.

【0098】

Now, operations will be described. The electric energy amount information generating means 28 generates, based on the receiving quality information S4 from the plurality of receiving quality detection means 22, electric energy amount information S14 for each passing band for an output to the transmitting signal generating means 24.

【0099】

This electric energy amount information S14 is information regarding an amount of electric energy-designating value (for example, 1dB or the like) for each passing band which the transmitting/receiving apparatus 2 demands from the signal S1 transmitted by the transmitting/receiving apparatus 1.

【0100】

Namely, the electric energy amount information generating means 28 judges, based on the receiving quality information S4 for each passing band, the electric energy amount that is necessary for a data demodulation in bands where the receiving quality has deteriorated.

【0101】

The electric energy amount information generating means 28 then generates, based on the judgement results, the electric energy amount information S14. Herein, the electric energy amount information S14 corresponds to the receiving quality control signal S5 of Embodiment 1.

【0102】

The transmitting signal generating means 24 generates the signal S7 by means of the electric energy amount information S14 that was inputted from the electric energy amount information generating means 28 and the transmitting data S6.

【0103】

The electric energy amount information extracting means 14 of the transmitting/receiving apparatus 1 takes out the receiving data S8 from the received signal S7 and also extracts the electric energy amount information S14.

【0104】

The electric energy amount information extracting means 14 then outputs the extracted electric energy amount information S14 to the

transmitting signal control information generating means 15. The transmitting signal control information generating means 15 generates, based on the electric energy amount information S14, the transmitting signal control information S9, for an output to the transmitting signal control means 11.

【0105】

This transmitting signal control information S9 is a signal for setting the electric energy amount of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 to an electric energy amount designated by the electric energy amount information S14. Other operations are similar to those of the transmitting/receiving system (Embodiment 1) of Fig. 1.

【0106】

In addition, the transmitting signal control information S9 is based on the electric energy amount information S14, therefore it can be expressed that control of transmitting electric energy by the transmitting signal control means 11 is performed based on the electric energy amount

information S14 (which corresponds to the receiving quality control signal S5).

【0107】

As above, in the present embodiment, the transmitting/receiving apparatus 2 generates the electric energy amount information S14 concerning the electric energy amount-designating value for each passing band which is demanded in the signal S1 to be transmitted by the transmitting/receiving apparatus 1, for a transmission to the transmitting/receiving apparatus 1.

【0108】

Therefore, the transmitting/receiving apparatus 1 can transmit the signal S1 that satisfies the electric energy amount-designating value demanded by the transmitting/receiving apparatus 2. As a result, the receiving quality in the transmitting/receiving apparatus 2 can be made satisfactory. Moreover, effects which are similar to those of Embodiment 1 are also provided.

【0109】

In addition, the electric energy amount information S14 generated by the electric energy amount information generating means 28, that is, the electric energy amount-designating value may be either of a relative value or an absolute value, wherein similar effects can be obtained.

【0110】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained. Moreover, in the present embodiment, a modulator-demodulator means may be provided.

【0111】

In addition, as the receiving quality detection means 22 of the present embodiment, the error detection means 22 and the signal level measuring means 26 of Embodiment 2 may be used. In this case, effects which are similar to those of Embodiment 2 are also provided.

【0112】

In addition, the electric energy amount information S14 generated for each passing band may be output to the transmitting signal generating

means 24 in a lump.

【0113】

(Embodiment 5)

Fig. 7 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 5 of the invention. In Fig. 7, identical symbols are used for portions and signals that are identical to those of Fig. 1 and description thereof will be omitted.

【0114】

The transmitting/receiving system of Fig. 7 shows a concrete construction example of the receiving quality control means 23 of the transmitting/receiving system of Fig. 1. Namely, the receiving quality control means 23 of the transmitting/receiving system of the present embodiment includes an error rate of receiving data-measuring means 29.

【0115】

In addition, in the transmitting/receiving system of Fig. 7, in place of the receiving quality control signal extracting means 12 of the transmitting/receiving system of Fig. 1, an error rate of receiving

data-extracting means 16 is provided and furthermore, a transmitting signal control information generating means 15 is added. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 1.

【0116】

Now, operations will be described. The error rate of receiving data-measuring means 29 measures, based on the receiving quality information S4 from the plurality of receiving quality detection means 22, an error rate of receiving data S15 for an output to the transmitting signal generating mean S24.

【0117】

That is, the error rate of receiving data-measuring means 29 measures the error rate of receiving data S15 for each passing band based on the receiving quality information S4 for each passing band.

【0118】

This error rate of receiving data S15 is a ratio of the number of error bits included in the receiving data per unit time (an error rate).

Herein, the error rate of receiving data S15 corresponds to the receiving quality control signal S5 of Embodiment 1.

【0119】

In addition, as the receiving quality information S4 to be inputted into the error rate of receiving data-measuring means 29, for example, a signal which becomes H-level only at a point in time when errors occur.

【0120】

The transmitting signal generating means 24 generates the signal S7 by means of the error rate of receiving data S15 inputted from the error rate of receiving data-measuring means 29 and the transmitting data S6.

【0121】

The error rate of receiving data-extracting means 16 of the transmitting/receiving apparatus 1 takes out the receiving data S8 from the received signal S7 and also extracts the error rate of receiving data S15.

【0122】

The error rate of receiving data-extracting means 16 outputs the

extracted error rate of receiving data S15 to the transmitting signal control information generating means 15. The transmitting signal control information generating means 15 generates, based on the error rate of receiving data S15, the transmitting signal control information S9 for an output to the transmitting signal control means 11.

【0123】

This transmitting signal control information S9 is a signal for adjusting the electric energy amount of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 while taking the error rate of receiving data S15 for each band into consideration. Other operations are similar to those of the transmitting/receiving system of Fig. 1 (Embodiment 1).

【0124】

In addition, the transmitting signal control information S9 is based on the error rate of receiving data S15, therefore it can be expressed that control of transmitting electric energy by the transmitting signal control means 11 is performed based on the error rate of receiving data S15

(which corresponds to the receiving quality control signal S5).

【0125】

As above, in the present embodiment, the transmitting/receiving apparatus 2 measures the error rate of receiving data S15, which is a ratio of the number of error bits included in the receiving data per unit time, for a transmission to the transmitting/receiving apparatus 1.

【0126】

Therefore, the transmitting/receiving apparatus 1 can generate the signal S1 to be transmitted while taking the error rate of receiving data S15 in the transmitting/receiving apparatus 2 into consideration. As a result, errors of receiving data in the transmitting/receiving apparatus 2 can be reduced. That is, deterioration in the receiving quality of the transmitting/receiving apparatus 2 can be reduced.

【0127】

In addition, the error rate of receiving data S15 to be outputted by the error rate of receiving data-measuring means 29 may be either of a relative value or an absolute value, wherein similar effects can be

obtained.

【0128】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained. Moreover, in the present embodiment, a modulator-demodulator means may be provided.

【0129】

In addition, as the receiving quality detection means 22 of the present embodiment, the error detection means 22 and the signal level measuring means 26 of Embodiment 2 may be used. In this case, effects which are similar to those of Embodiment 2 are also provided.

【0130】

In addition, the error rates of receiving data S15 generated for each passing band may be output to the transmitting signal generating means 24 in a lump.

【0131】

(Embodiment 6)

Fig. 8 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 6 of the invention. In Fig. 8, identical symbols are used for portions and signals that are identical to those of Fig. 1 and description thereof will be omitted.

【0132】

The transmitting/receiving system of Fig. 8 shows a concrete construction example of the receiving quality control means 23 of the transmitting/receiving system of Fig. 1. Namely, the receiving quality control means 23 of the transmitting/receiving system of the present embodiment includes a number of error bits in receiving-measuring means 30.

【0133】

In addition, in the transmitting/receiving system of Fig. 8, in place of the receiving quality control signal extracting means 12 of the transmitting/receiving system of Fig. 1, the number of error bits in receiving-extracting means 17 is provided and furthermore, the transmitting signal control information generating means 15 is added.

Other elements of construction are the same as those of the transmitting/receiving system of Fig. 1.

【0134】

Now, operations will be described. The number of error bits in receiving-measuring means 30 measures, based on the receiving quality information S4 from the plurality of receiving quality detection means 22, the number of error bits in receiving S16 for an output to the transmitting signal generating means 24.

【0135】

That is, the number of error bits in receiving-measuring means 30 measures the number of error bits in receiving S16 for each passing band based on the receiving quality information S4 for each passing band.

【0136】

This number of error bits in receiving S16 is the number of error bits per unit time. Herein, the number of error bits in receiving S16 corresponds to the receiving quality control signal S5 of Embodiment 1.

【0137】

In addition, as the receiving quality information S4 to be inputted into the number of error bits in receiving-measuring means 30, for example, a signal which becomes H-level only at a point in time when errors occur.

【0138】

The transmitting signal generating means 24 generates the signal S7 by means of the number of error bits in receiving S16 inputted from the number of error bits in receiving-measuring means 30 and the transmitting data S6.

【0139】

The number of error bits in receiving-extracting means 17 of the transmitting/receiving apparatus 1 takes out the receiving data S8 from the received signal S7 and also extracts the number of error bits in receiving S16.

【0140】

The number of error bits in receiving-extracting means 17 then outputs the number of error bits in receiving S16 extracted to the

transmitting signal control information generating means 15. The transmitting signal control information generating means 15 generates, based on the number of error bits in receiving S16, the transmitting signal control information S9, for an output to the transmitting signal control means 11.

【0141】

This transmitting signal control information S9 is a signal for adjusting the electric energy amount of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 while taking the number of error bits in receiving S16 for each band into consideration. Other operations are similar to those of the transmitting/receiving system of Fig. 1 (Embodiment 1).

【0142】

In addition, the transmitting signal control information S9 is based on the number of error bits in receiving S16, therefore it can be expressed that control of transmitting electric energy by the transmitting signal control means 11 is performed based on the number of error bits in

receiving S16 (which corresponds to the receiving quality control signal S5).

【0143】

As above, in the present embodiment, the transmitting/receiving apparatus 2 measures the number of error bits in receiving S16, which is the number of error bits included in the receiving data per unit time, for a transmission to the transmitting/receiving apparatus 1.

【0144】

Therefore, the transmitting/receiving apparatus 1 can generate the signal S1 to be transmitted while taking the number of error bits in receiving S16 in the transmitting/receiving apparatus 2 into consideration. As a result, errors of receiving data in the transmitting/receiving apparatus 2 can be reduced. That is, deterioration in the receiving quality of the transmitting/receiving apparatus 2 can be reduced.

【0145】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems),

similar effects can be obtained. Moreover, in the present embodiment, a modulator-demodulator means may be provided.

【0146】

In addition, as the receiving quality detection means 22 of the present embodiment, the error detection means 22 and the signal level measuring means 26 of Embodiment 2 may be used. In this case, effects which are similar to those of Embodiment 2 are also provided.

【0147】

In addition, the number of error bits in receiving S16 generated for each passing band may be output to the transmitting signal generating means 24 in a lump.

【0148】

(Embodiment 7)

Fig. 9 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 7 of the invention. In Fig. 9, identical symbols are used for portions and signals that are identical to those of Fig. 1 and description thereof will be omitted.

【0149】

The transmitting/receiving system of Fig. 9 is the transmitting/receiving system of Fig. 1 which is provided with a modulation means 18 and a demodulation means 31.

【0150】

As shown in Fig. 9, in the transmitting/receiving apparatus 1, the modulation means 18 includes the transmitting signal control means 11. Also, in the transmitting/receiving apparatus 2, the demodulation means 31 is provided between the band-pass means 21 and the receiving quality detection means 22. Construction other than these is the same as that of the transmitting/receiving system of Fig. 1.

【0151】

Now, operations will be described. In the transmitting/receiving apparatus 1, the modulation means 18 applies a modulation to the transmitting data S10. This modulation means 18 employs a modulating method according to the characteristics of the transmission way 3.

【0152】

As one example of the modulating methods to be employed, for a transmission way where distortion is small, a multi-valued modulation is performed. By performing as such, a large amount of information bits are contained in one modulated wave, thus enabling a more speedy transmission.

【0153】

As another example of the modulating methods to be employed, for a transmission using bands where broadcast waves of radios etc., exist, a multi-carrier modulation is performed.

【0154】

By performing as such, a transmission of carriers in the bands where broadcast waves exist is stopped, thus interference with and/or due to the broadcast waves becomes avoidable. Furthermore, the multi-carrier modulation will be described in detail in Embodiment 8.

【0155】

The transmitting signal control means 11 generates the signal S1 by means of the modulated transmitting data S10.

【0156】

At this time, the transmitting signal control means 11 adjusts, based on the transmitting signal control information S9 inputted from the receiving quality control signal extracting means 12, the transmitting electric energy of the modulated transmitting data S10 for each frequency band (each passing band in the transmitting/receiving apparatus 2) for an output as the signal S1.

【0157】

That is, the transmitting signal control means 11 performs, based on the transmitting signal control information S9, control of transmitting electric energy for bands where the receiving quality has deteriorated. Other operations in the transmitting/receiving apparatus 1 are similar to those of Embodiment 1.

【0158】

On the other hand, in the transmitting/receiving apparatus 2, the band-pass means 21 outputs the band-pass signal S2 to the corresponding demodulation means 31.

【0159】

The demodulation means 31 demodulates the band-pass signal S2 and outputs the demodulated data S17 to the receiving quality detection means 22. Herein, the demodulation means 31 is conformable to the modulating method of the modulation means 18.

【0160】

The receiving quality detection means 22 takes out the receiving data S3 from the demodulated data S17 and also detects the receiving quality information S4 by means of the demodulated data S17 for an output to the receiving quality control means 23. Other operations in the transmitting/receiving apparatus 2 are similar to those of Embodiment 1.

【0161】

As above, in the present embodiment, the transmitting/receiving apparatus 1 comprises the modulation means 18 which applies a modulation according to the characteristics of the transmission way 3.

【0162】

As a result, the transmitting/receiving apparatus 1 can transmit the

signal S1 which is not easily adversely affected by the transmission way 3. Moreover, effects which are similar to those of Embodiment 1 are provided.

【0163】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained.

【0164】

Moreover, a transmitting/receiving system may be constructed by combining the present embodiment and Embodiments 2-6.

【0165】

(Embodiment 8)

Fig. 10 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 8 of the invention. In Fig. 10, identical symbols are used for portions and signals that are identical to those of Fig. 9 and description thereof will be omitted.

【0166】

In the transmitting/receiving system of Fig. 10, in place of the modulation means 18 of the transmitting/receiving system of Fig. 9, a multi-carrier modulation means 19 is provided. A demodulation means 32 of Fig. 10 is conformable to a multi-carrier modulation method. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 9.

【0167】

Now, operations will be described. In the transmitting/receiving apparatus 1, the multi-carrier modulation means 19 applies a multi-carrier modulation to the transmitting data S10.

【0168】

The transmitting signal control means 11 generates the signal S1 by means of the multi-carrier-modulated transmitting data S10.

【0169】

At this time, the transmitting signal control means 11 controls, based on the transmitting signal control information S9 inputted from the receiving quality control signal extracting means 12, the transmitting

electric energy of the multi-carrier-modulated transmitting data S10 for each frequency band (control of transmitting electric energy) for an output as the signal S1. Other operations are similar to those of Embodiment 7.

【0170】

As control of the transmitting electric energy by the transmitting signal control means 11, in order to improve the receiving quality in the transmitting/receiving apparatus 2, in addition to the control, as in Embodiment 1, for adjusting the electric energy level of the signal S1 to be transmitted, control for reducing or stopping the output of the signal S1 to be transmitted is also performed. Hereinafter, a detailed description will be given in this respect.

【0171】

Fig. 11 is an exemplary diagram of the signal S1 obtained by applying a multi-carrier modulation and control of transmitting electric energy to the transmitting data S10. Fig. 11 shows a case where three band-pass means 21 exist in the transmitting/receiving apparatus 2. That is, the three band-pass means 21 have different passing bands 50, 51, and

52, respectively.

【0172】

As shown in Fig. 11, a multi-carrier modulation is a method wherein a plurality of carriers C1-C6 (in Fig. 11, two carriers per one band-pass means) are lined up and transmitted.

【0173】

Accordingly, in the multi-carrier modulation method, if the SN ratio deteriorates in some bands, only a signal of the deteriorated bands cannot be demodulated but a signal in other bands can be demodulated.

【0174】

Therefore, with respect to bands where deterioration in the receiving quality of the transmitting/receiving apparatus 2 is not improved even adjusting the level of the signal S1 to be transmitted by maximizing the transmitting electric energy amount of the signal S1, etc., the transmitting signal control means 11 can perform control for reducing or stopping the output of the signal 1 to be transmitted.

【0175】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy outputs, a reduction in electric energy consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained.

【0176】

In Fig. 11, the carriers C3 and C4 which are indicated by broken lines show carriers which have been stopped from being transmitted through control of the transmitting electric energy by the transmitting signal control means 11. That is, transmission is stopped in a passing band 51.

【0177】

Also, in Fig. 11, when a passing band 50 and a passing band 52 are compared, the carriers C1 and C2 are different from the carriers C5 and C6 in gain (amount of electric energy) due to the control of transmitting electric energy which is similar to that of Embodiment 1.

【0178】

As above, in the present embodiment, the multi-carrier modulation

method is employed. Therefore, with respect to the passing bands where deterioration in the receiving quality is not improved even by performing transmitting electric energy control which is similar to that of Embodiment 1, control for reducing or stopping the output of the transition signal S1 can be carried out.

【0179】

As a result, effects such that a reduction in interference waves to other systems, a reduction in electric power consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained. Moreover, effects similar to those of Embodiment 1 are provided.

【0180】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained.

【0181】

Moreover, a transmitting/receiving system may be constructed by

combining the present embodiment and Embodiments 2-6.

【0182】

(Embodiment 9)

Fig. 12 is an overall constructional block diagram of the transmitting/receiving system according to Embodiment 9 of the invention. In Fig. 11, identical symbols are used for portions and signals that are identical to those of Fig. 9 and description thereof will be omitted.

【0183】

In the transmitting/receiving system of Fig. 12, in place of the modulation means 18 of Fig. 9, a spread spectrum modulation means 20 is provided. A demodulation means 33 of Fig. 11 is conformable to a spread spectrum modulating method. Other elements of construction are the same as those of the transmitting/receiving system of Fig. 9.

【0184】

Now, operations will be described. In the transmitting/receiving apparatus 1, the spread spectrum modulation means 20 applies a spread spectrum modulation to the receiving data S10.

【0185】

The transmitting signal control means 11 generates the signal S1 by means of the spread spectrum-modulated transmitting data S10.

【0186】

At this time, the transmitting signal control means 11 controls, based on the transmitting signal control information S9 inputted from the receiving quality control signal extracting means 12, the transmitting electric energy of the spread spectrum-modulated transmitting data S10 for each frequency band (control of transmitting electric energy) for an output as the signal S1. Other operations are similar to those of Embodiment 7.

【0187】

As control of the transmitting electric energy by the transmitting signal control means 11, in order to improve the receiving quality in the transmitting/receiving apparatus 2, in addition to the control, as in Embodiment 1, for adjusting the electric energy level of the signal S1 to be transmitted, control for reducing or stopping the output of the signal S1 to be transmitted is also performed. Hereinafter, a detailed description

will be given in this respect.

【0188】

The spread spectrum method is a broadband communication system. Accordingly, even if noise and distortion occur in some bands, when the SN ratio can be secured in other bands, demodulation is possible.

【0189】

Therefore, with respect to bands where deterioration in the receiving quality of the transmitting/receiving apparatus 2 is not improved even by adjusting the level of the signal S1 to be transmitted by maximizing the transmitting electric energy amount of the signal S1, etc., the transmitting signal control means 11 can perform control for reducing or stopping the output of the signal S1 to be transmitted.

【0190】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy outputs, a reduction in electric power consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained.

【0191】

Fig. 13 is an exemplary diagram of the signal S1 obtained by applying a spread spectrum modulation and control of transmitting electric energy for the transmitting data S10. Similar to Fig. 11, Fig. 13 shows a case where three band-pass means 21 exist in the transmitting/receiving apparatus 2.

【0192】

In Fig. 13, the concave portion of the signal S1 to be transmitted by the transmitting/receiving apparatus 1 shows a waveform of the band where a transmission is stopped through control of transmitting electric energy. That is, in the passing band 51, transmission is stopped.

【0193】

Also, in Fig. 13, when the waveform of the passing band 50 and the waveform of the passing band 52 are compared, both are different in gain (amount of electric energy) due to the control of transmitting electric energy which is similar to that of Embodiment 1.

【0194】

As mentioned above, in the present embodiment, the spread spectrum modulation method is employed. Therefore, with respect to the passing bands where deterioration in the receiving quality is not improved even by performing transmitting electric energy control which is similar to that of Embodiment 1, control for reducing or stopping the output of the signal S1 to be transmitted can be carried out.

【0195】

As a result, effects such that a reduction in interference waves to other systems, a reduction in electric power consumption of the transmitting/receiving system, and prevention in saturation of an analogue portion amplifier can be obtained. Moreover, effects similar to those of Embodiment 1 are provided.

【0196】

In addition, as long as the band-pass means 21 (band-pass units U1-Un) are composed of two systems or more (a plurality of systems), similar effects can be obtained.

【0197】

Moreover, a transmitting/receiving system may be constructed by combining the present embodiment and Embodiments 2-6.

【0198】

[EFFECT OF THE INVENTION]

In the transmitting/receiving system as set forth in Claim 1, the first transmitting/receiving apparatus can transmit a signal at an appropriate level where the receiving quality in the second transmitting/receiving apparatus is taken into consideration. As a result, deterioration in the receiving quality of the second transmitting/receiving apparatus can be reduced.

【0199】

In the transmitting/receiving system as set forth in Claim 2, the receiving quality in the second transmitting/receiving apparatus can be properly judged and the first transmitting/receiving apparatus can transmit a signal on a more appropriate level. As a result, deterioration in the receiving quality in the second transmitting/receiving apparatus can further be reduced.

【0200】

In the transmitting/receiving system as set forth in Claim 3, compared to a case where a receiving quality control signal having different content from the receiving quality information is generated, the receiving quality control means can be simplified.

【0201】

In the transmitting/receiving system as set forth in Claim 4, the first transmitting/receiving apparatus can use the content of the receiving quality control signal to be transmitted by the second transmitting/receiving apparatus without modification and adjust the electric energy level of the signal to be transmitted.

【0202】

In the transmitting/receiving system as set forth in Claim 5, the first transmitting/receiving apparatus can transmit a signal which satisfies the amount of electric energy-designating value demanded by the second transmitting/receiving apparatus. As a result, the receiving quality in the

second transmitting/receiving apparatus can be made satisfactory.

【0203】

In the transmitting/receiving system as set forth in Claim 6, the first transmitting/receiving apparatus can, in addition to the first or second invention, generate a signal to be transmitted while taking the error rate of receiving data of the second transmitting/receiving apparatus into consideration. As a result, receiving errors in the second transmitting/receiving apparatus can be reduced.

【0204】

In the transmitting/receiving system as set forth in Claim 7, the first transmitting/receiving apparatus can generate a signal to be transmitted with the number of error bits of the second transmitting/receiving apparatus taken into consideration. As a result, receiving errors in the second transmitting/receiving apparatus can be reduced.

【0205】

In the transmitting/receiving system as set forth in Claim 8, the first transmitting/receiving apparatus can transmit a signal which is not easily

adversely affected by the transmission way.

【0206】

In the transmitting/receiving system as set forth in Claim 9, since a multi-carrier method is employed, if the SN ratio deteriorates in some bands, a signal only in the deteriorated bands cannot be demodulated but a signal in other bands can be demodulated.

【0207】

Therefore, with respect to bands where deterioration in the receiving quality of the second transmitting/receiving apparatus is not improved even though the first transmitting/receiving apparatus adjusts the level of the signal to be transmitted based on the receiving quality control signal, the first transmitting/receiving apparatus can perform control for reducing or stopping output of a signal to be transmitted.

【0208】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy outputs a reduction in electric power consumption of the transmitting/receiving system, and prevention

in saturation of an analogue portion amplifier can be obtained.

【0209】

In the transmitting/receiving system as set forth in Claim 10, since a spread spectrum method is employed, even if the SN ratio deteriorates in some bands, when the SN ratio can be secured in other bands, demodulation is possible.

【0210】

Therefore, with respect to bands where deterioration in the receiving quality of the second transmitting/receiving apparatus is not improved even though the first transmitting/receiving apparatus adjusts the level of the signal to be transmitted based on the receiving quality control signal, the first transmitting/receiving apparatus can perform control for reducing or stopping output of a signal to be transmitted.

【0211】

As a result, effects such that a reduction in interference waves to other systems due to unnecessary energy output, a reduction in electric power consumption of the transmitting/receiving system, and prevention

in saturation of an analogue portion amplifier can be obtained.

[DESCRIPTION OF DRAWINGS]

[Fig. 1]

Fig. 1 is a block diagram of the transmitting/receiving system according to Embodiment 1 of the invention.

[Fig. 2]

Fig. 2 is an exemplary diagram of passing bands of the band-pass means.

[Fig. 3]

Fig. 3 is a constructional diagram of the signal S7 to be transmitted to the transmitting/receiving apparatus which carries out transmitting electric energy control.

[Fig. 4]

Fig. 4 is a block diagram of the transmitting/receiving system according to Embodiment 2 of the invention.

[Fig. 5]

Fig. 5 is a block diagram of the transmitting/receiving system

according to Embodiment 3 of the invention.

[Fig. 6]

Fig. 6 is a block diagram of the transmitting/receiving system according to Embodiment 4 of the invention.

[Fig. 7]

Fig. 7 is a block diagram of the transmitting/receiving system according to Embodiment 5 of the invention.

[Fig. 8]

Fig. 8 is a block diagram of the transmitting/receiving system according to Embodiment 6 of the invention.

[Fig. 9]

Fig. 9 is a block diagram of the transmitting/receiving system according to Embodiment 7 of the invention.

[Fig. 10]

Fig. 10 is a block diagram of the transmitting/receiving system according to Embodiment 8 of the invention.

[Fig. 11]

Fig. 11 is an exemplary diagram of the signal S1 obtained by applying a multi-carrier modulation and transmitting electric energy control.

[Fig. 12]

Fig. 12 is a block diagram of the transmitting/receiving system according to Embodiment 9 of the invention.

[Fig. 13]

Fig. 13 is an exemplary diagram of the signal S1 obtained by applying a spread spectrum modulation and transmitting electric energy control.

[Fig. 14]

Fig. 14 is a block diagram of the prior subband receiving unit.

[DESCRIPTION OF SYMBOLS]

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

13 electric energy control signal extracting means

14 electric energy amount information extracting means

15 transmitting signal control information generating means

16 error rate of receiving data-extracting means

17 number of error bits in receiving-extracting means

18 modulation means

19 multi-carrier modulation means

20 spread spectrum modulation means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

25 error detection means

26 signal level measuring means

27 electric energy control signal generating means

28 electric energy amount information generating means

29 error rate of receiving data-measuring means

30 number of error bits in receiving-measuring means

31, 32, 33 demodulation means

U1-Un band-pass units

S4 receiving quality information

S5 receiving quality control signal

S9 transmitting signal control information

S11 bit error information

S12 signal level information

S13 electric energy control signals

S14 electric energy amount information

S15 error rate of receiving data

S16 number of error bits in receiving

[DOCUMENT NAME] ABSTRACT

[ABSTRACT]

[PROBLEM TO BE SOLVED] The present invention aims at reducing deterioration in the receiving quality and providing a transmitting/receiving system wherein high quality communications can be realized.

[SOLUTION] Each band-pass unit U1-Un of a second transmitting/receiving apparatus comprises a band-pass means 21 and a receiving quality detection means 22. The respective band-pass means 21 have different passing bands. The receiving quality detection means 22 detects receiving quality information S4 of a signal S2 that has passed through the band-pass means 21. A receiving quality control means 23 generates a receiving quality control signal S5 based on the receiving quality information S4. The receiving quality control signal S5 is a signal which becomes a basis for controlling the electric energy level of a signal S1 transmitted by a first transmitting/receiving apparatus. The first transmitting/receiving apparatus adjusts the level of the signal S1 to

be transmitted for each passing band.

[SELECTED FIGURE] Fig. 1

Fig.1

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S5 receiving quality control signal

S9 transmitting signal control information

Fig.2

50, 51 passband

S1 receiving signal

↑ gain

→ frequency

Fig.3

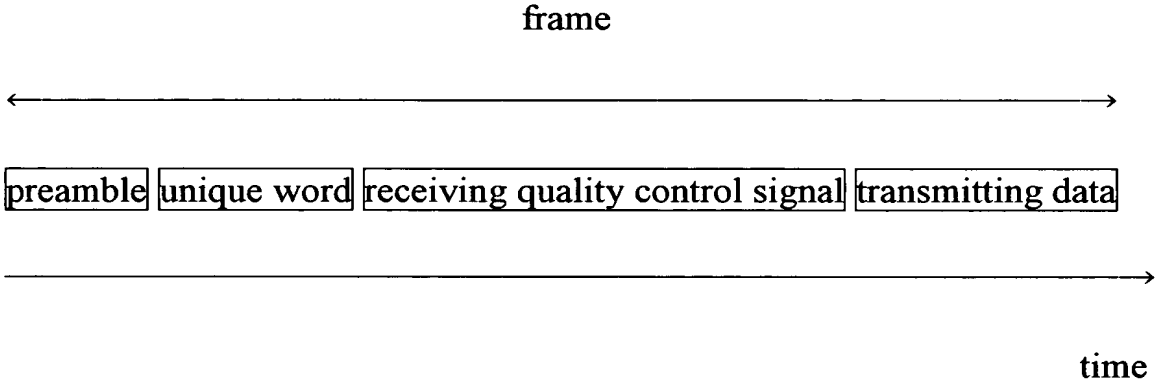

Fig.4

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

25 error detection means

26 signal level measuring means

S3, S8 receiving data

S6, S10 transmitting data

S5 receiving quality control signal

S9 transmitting signal control information

S11 bit error information

S12 signal level information

Fig.5

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

13 electric energy control signal extracting means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

27 electric energy control signal generating means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S9 transmitting signal control information

S13 electric energy control signals

Fig.6

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

14 electric energy amount information extracting means

15 transmitting signal control information generating means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

28 electric energy amount information generating means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S9 transmitting signal control information

S14 electric energy amount information

Fig.7

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

15 transmitting signal control information generating means

16 error rate of receiving data-extracting means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

29 error rate of receiving data-measuring means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S9 transmitting signal control information

S15 error rate of receiving data

Fig.8

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

15 transmitting signal control information generating means

17 number of error bits in receiving-extracting means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

30 number of error bits in receiving-measuring means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S9 transmitting signal control information

S16 number of error bits in receiving

Fig.9

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

18 modulation means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

31 demodulation means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S5 receiving quality control signal

S9 transmitting signal control information

Fig.10

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

19 multi-carrier modulation means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generation means

32 demodulation means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S5 receiving quality control signal

S9 transmitting signal control information

Fig.11

50, 51, 52 passband

↑ gain

→ frequency

Fig.12

1,2 transmitting/receiving apparatus

3 transmission way

11 transmitting signal control means

12 receiving quality control signal extracting means

20 spread spectrum modulation means

21 band-pass means

22 receiving quality detection means

23 receiving quality control means

24 transmitting signal generating means

33 demodulation means

S3, S8 receiving data

S6, S10 transmitting data

S4 receiving quality information

S5 receiving quality control signal

S9 transmitting signal control information

Fig.13

50, 51, 52 passband

S1 transmitting signal

↑ gain

→ frequency

Fig.14

100 subband filter

101 demodulation means

102 receiving quality detection means

103 synthesizer